



TAPS

Training About
Protecting the Source

Hands-on Water Education

GETTING STARTED

Welcome to TAPS: Hands-on Water Education!

Please review and use the TAPS Manual as a guide in addition to this slide show.

You will need the Awesome Aquifer kit and a few additional materials (listed on the next page) to complete each of the TAPS activities. The Awesome Aquifer kit is available through the Groundwater Catalog at www.groundwater.org.

If you do not have the Awesome Aquifer kit you will need to collect all the materials listed for each activity including a clear plastic container such as one used for food storage or a clear 2 liter bottle cut in half length wise.

GETTING STARTED

Items you will need for TAPS in addition to the Awesome Aquifer kit.

- Foil
- Sugar cubes
- Powdered drink mix (KoolAid)
- Pencil
- Small plastic animal or house (optional)
- Film canister or other small plastic container that can easily be punctured
- Thumb tack
- Paper towel that has been slightly colored with food coloring and allowed to dry
- Paper towels for clean up
- Water

Once you have gathered all of your materials you are ready to begin TAPS!



IMPROPERLY ABANDONED WELL

Follow the instructions to build a model that will...

DEMONSTRATE HOW AN ABANDON WELL CAN CONTRIBUTE TO GROUNDWATER CONTAMINATION



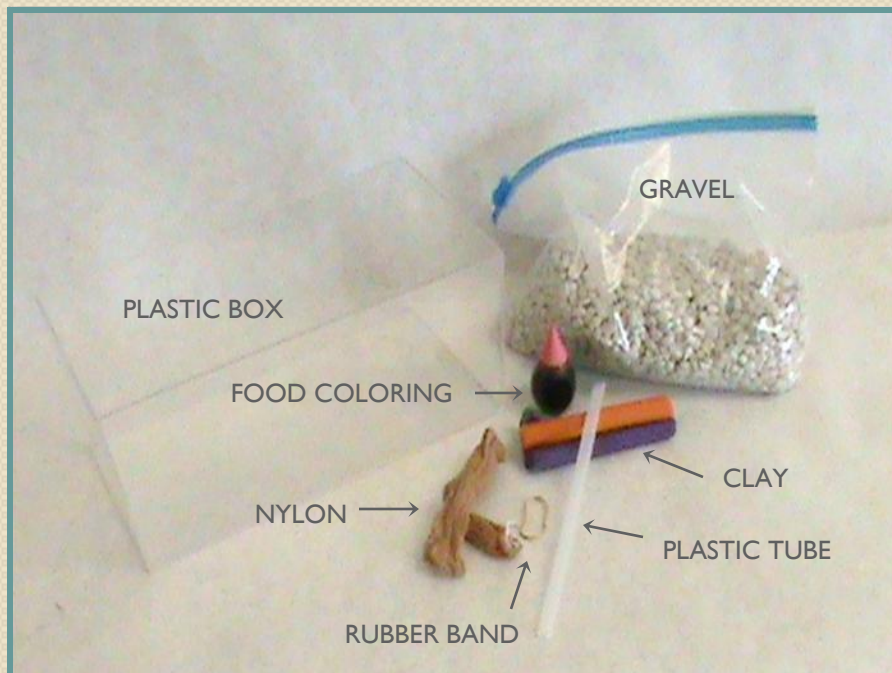
MATERIALS NEEDED

Use the following items from the Awesome Aquifer Kit:

Plastic box / Gravel / Clay / Food Coloring / Plastic tube / Nylon / Rubber band

Additional Items, not included in the kit:

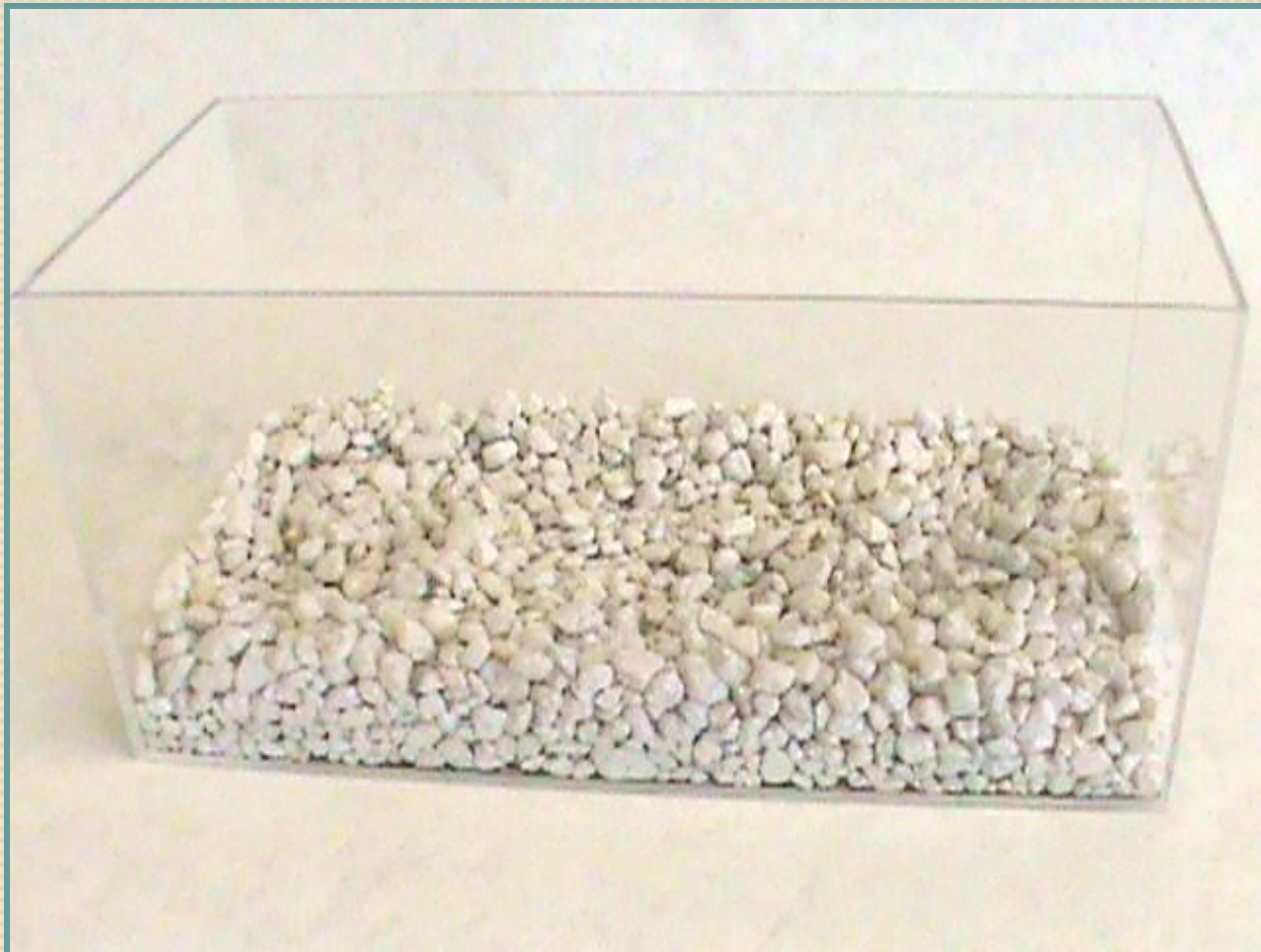
Aluminum foil (heavy duty foil recommended) / Water / Pencil



CREATE AN AQUIFER

Fill the plastic box with gravel until it is about $\frac{1}{4}$ - $\frac{1}{2}$ full.

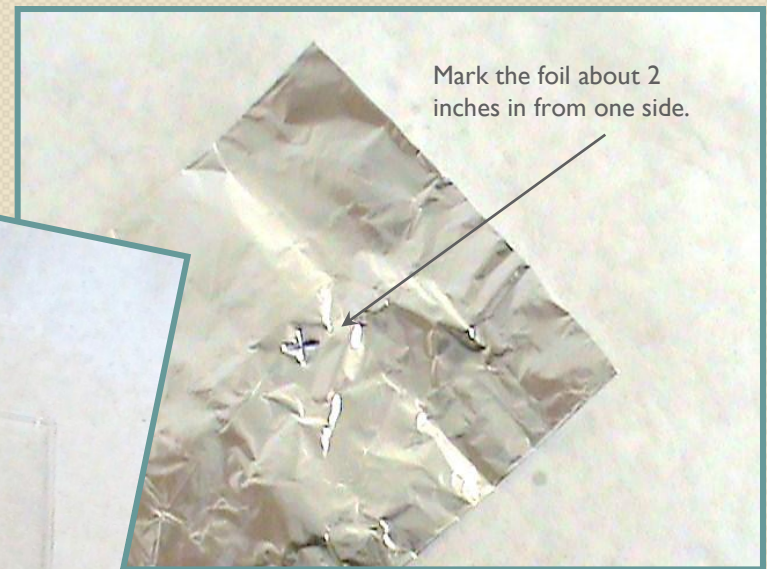
Add water so that half of the rocks are covered.



CREATE AN IMPERMEABLE OR CONFINING LAYER USING FOIL (1)

This should be slightly smaller in length and width as the container. Use the lid of the Awesome Aquifer kit as a pattern. You may want to use heavy duty foil or make a double layer for durability.

Once you have a piece of foil that fits inside the container mark the foil about two inches in from one of the short sides.



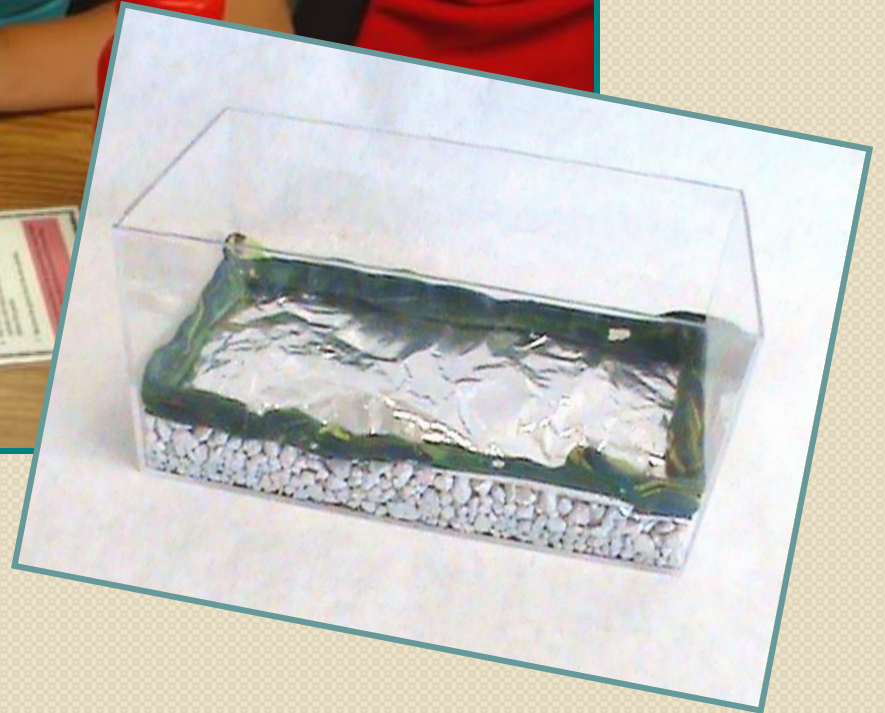
CREATE AN IMPERMEABLE OR CONFINING LAYER USING FOIL (2)

Roll the clay into a long skinny role (like a snake.)

Next place the foil on top of the gravel being careful not to puncture the foil.

Use the rolled clay to seal the edges of the foil to the box.





CREATE A WELL (1)

Use a plastic tube as your well.

Cover one end of the tube with nylon, securing it with a rubber band. The nylon screen on the bottom represents a well screen which prevents sands and gravels from entering the well.

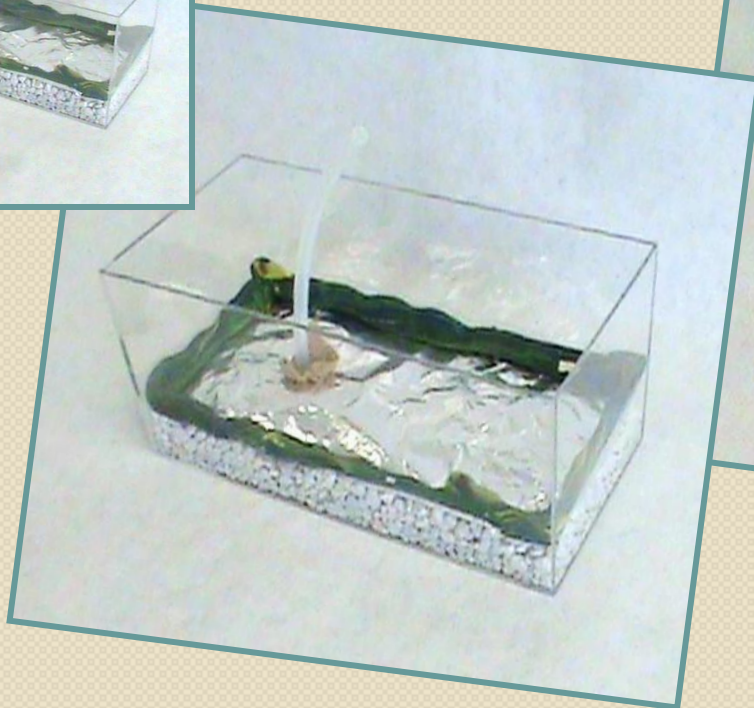


CREATE A WELL (2)

Use a pencil to puncture the foil at the spot marked (about two inches in from one of the short sides.)

Insert the tube (well.)

Add more gravel on top of the foil and around the well until the container is about $\frac{1}{2}$ to $\frac{3}{4}$ full.



WHAT HAPPENS WHEN YOU ADD COLORED WATER?

Apply water (dyed with a few drops of food coloring) to the gravel. Make sure to pour the same amount of water all over the surface and the well.

Observe where the colored water travels.



DISCUSSION OF RESULTS

Use the following questions to lead discussion after building and demonstrating the model of the improperly abandoned well. (See *TAPS Manual for answers.*)

- What might the colored water represent?
- What happened when you poured the colored water on the surface?
- Why is the result a problem?
- What could have been done to prevent this from happening?



SINKHOLES AND LAND EROSION

Follow the instructions to build a model that will...

DEMONSTRATE HOW SINKHOLES FORM, ALLOWING FIRST-HAND UNDERSTANDING OF THE CHALLENGES THAT GO ALONG WITH THE OCCURRENCE OF A SINKHOLE



MATERIALS NEEDED

Use the following items from the Awesome Aquifer Kit:

Plastic box / Gravel

Additional Items, not included in the kit:

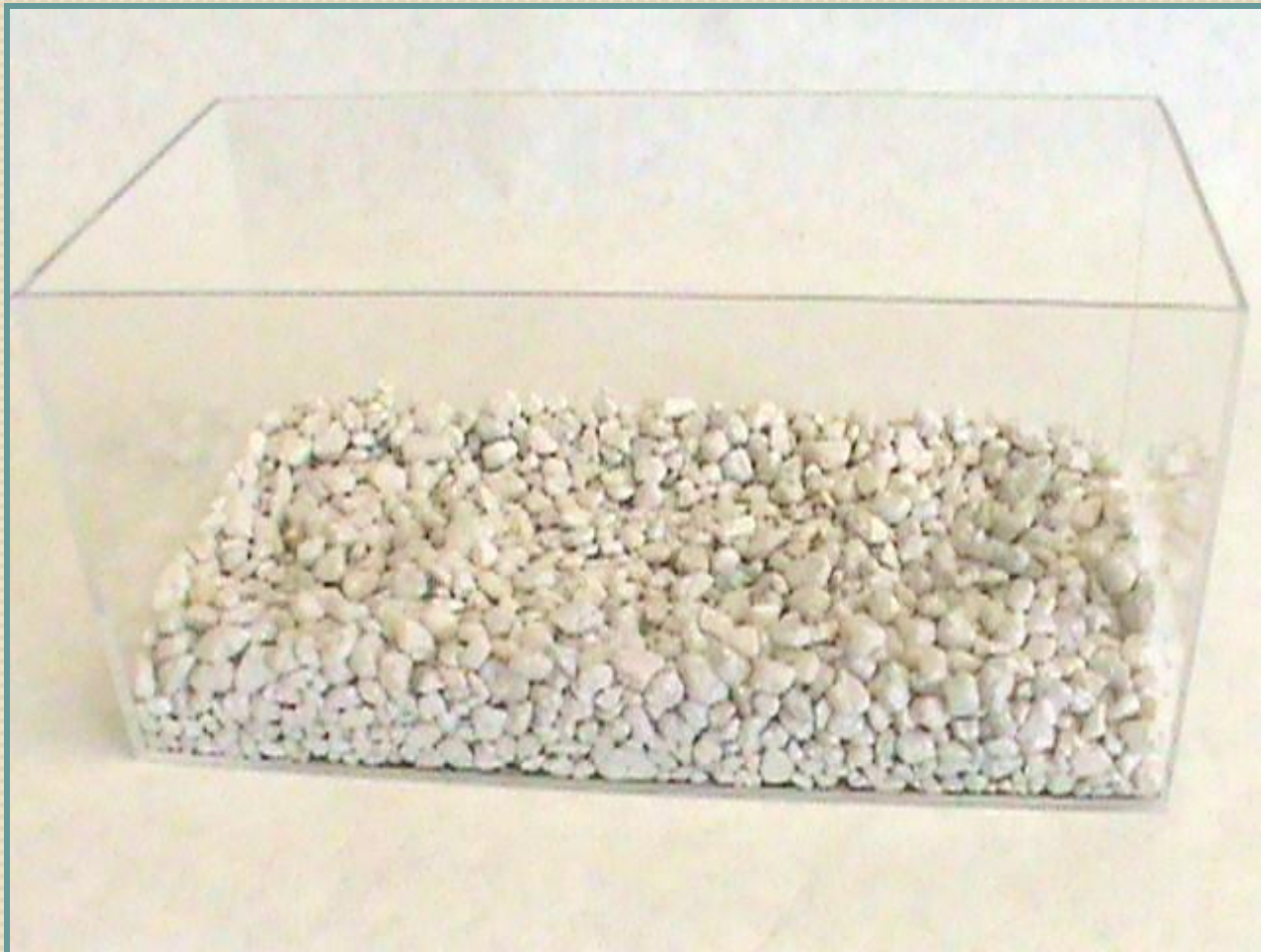
Sugar Cubes (at least 12) / Water (warm is best) / Small plastic toy animal or house (optional)



CREATE AN AQUIFER

Fill the plastic box with gravel until it is about $\frac{1}{4}$ - $\frac{1}{2}$ full.

Add water so that half of the rocks are covered.

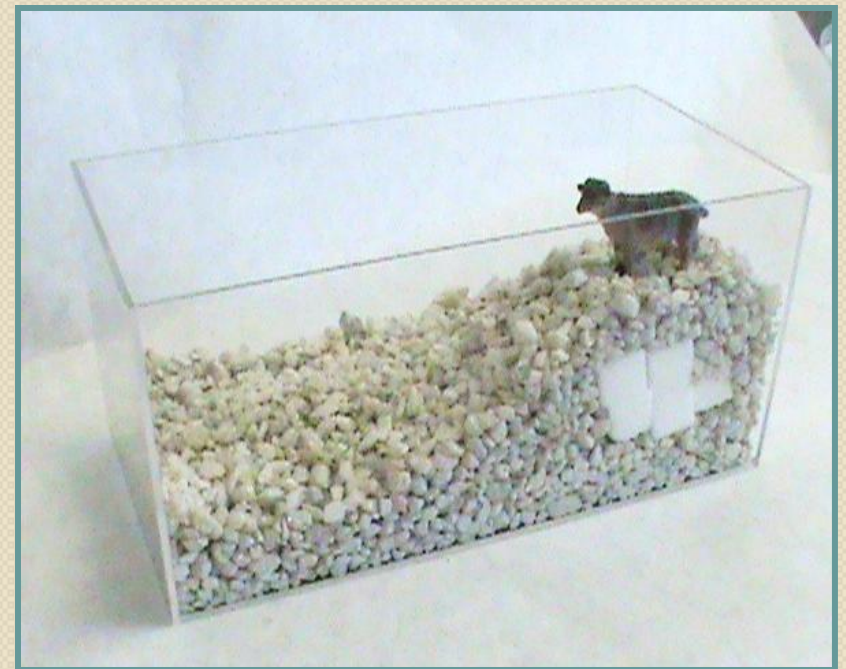


CREATE LAYERS OF LIMESTONE

Place sugar cubes on the gravel, next to the side of the plastic box. The sugar cubes should be at least three cubes across, two cubes wide, and two layers deep.

The sugar cubes will simulate layers of limestone.

Add more gravel on top to cover the sugar cubes creating a hill over the sugar cubes. (Or an alternative option is to add gravel so that the surface of the model is level.)



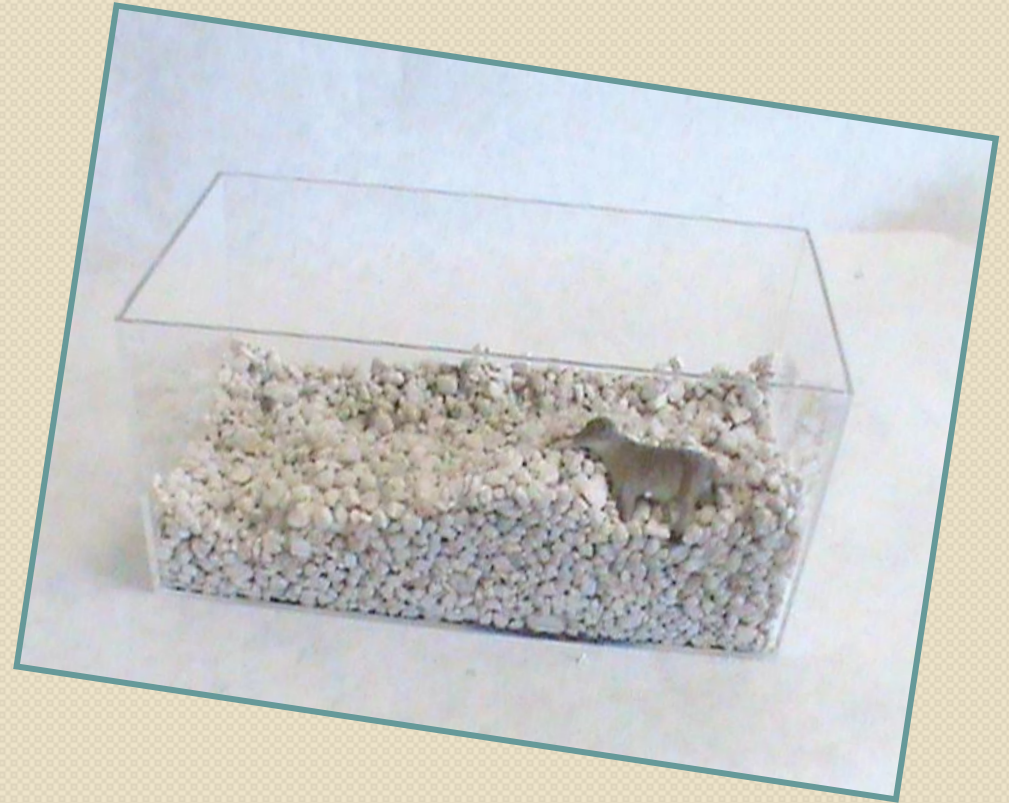


WHAT HAPPENS WHEN IT RAINS?

Place a small plastic toy animal or house on top of the gravel directly above the sugar cubes.

Pour water (preferably warm water) over the buried sugar cubes to simulate rain.

Watch and wait.



DISCUSSION OF RESULTS

Use the following questions to lead discussion after building and demonstrating the model of sinkholes and land erosion. (See *TAPS Manual* for answers.)

- What happened when the sugar cubes melted?
- What did this represent?
- What did the sugar cubes represent?
- Why do sinkholes occur?



OVER-APPLIED FERTILIZER

Follow the instructions to build a model that will...

DEMONSTRATE THE IMPACT OF EXCESSIVE FERTILIZER USE TO GROUNDWATER SUPPLIES



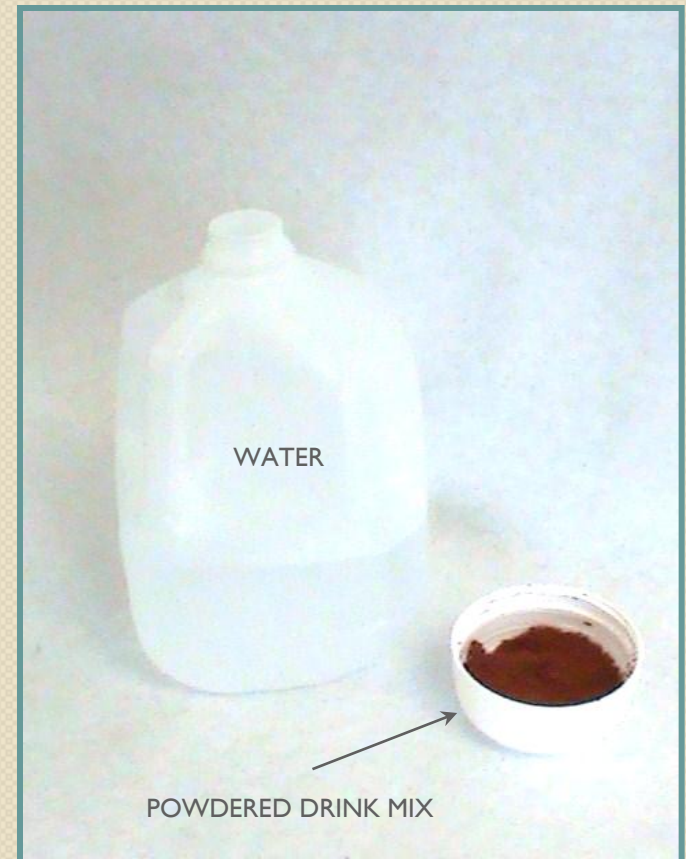
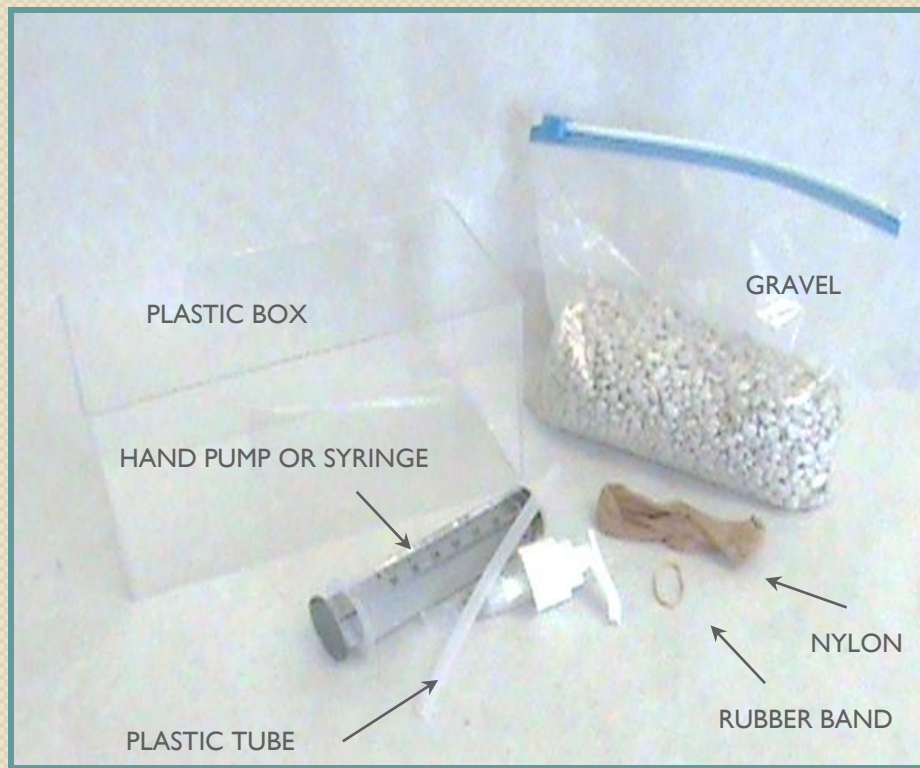
MATERIALS NEEDED

Use the following items from the Awesome Aquifer Kit:

Plastic box / Gravel / Hand pump or Syringe / Plastic tube / Nylon / Rubber band

Additional Items, not included in the kit:

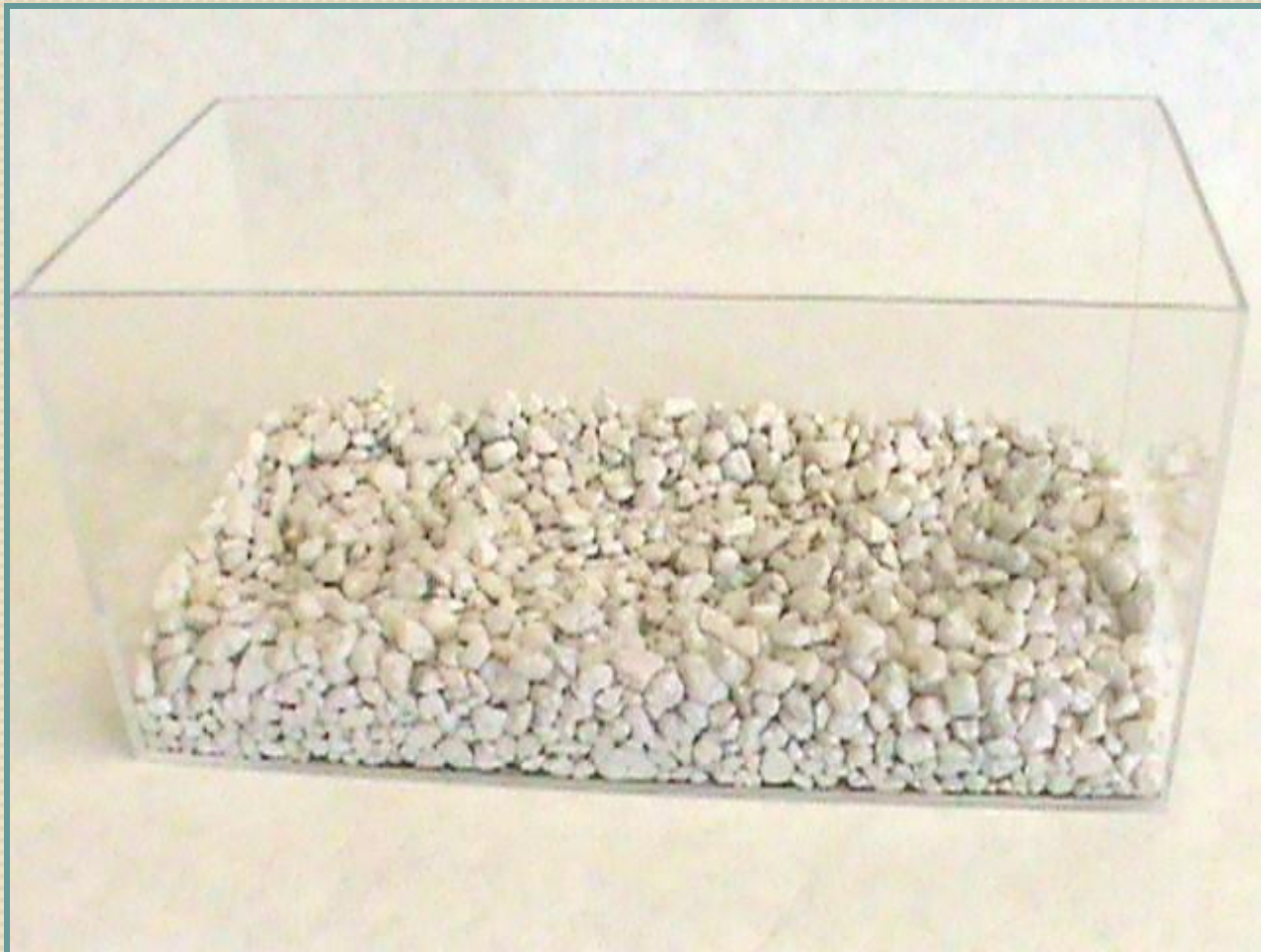
Powdered drink mix packet / Water



CREATE AN AQUIFER

Fill the plastic box with gravel until it is about $\frac{1}{4}$ - $\frac{1}{2}$ full.

Add water so that half of the rocks are covered.



CREATE A WELL (1)

Use a plastic tube as your well.

Cover one end of the tube with nylon, securing it with a rubber band. The nylon screen on the bottom represents a well screen which prevents sands and gravels from entering the well.



CREATE A WELL (2)

Insert the tube (well), with the well screen on the bottom, near one corner of the plastic box.

Push the well down so that it reaches the bottom of the model.

Add more gravel until the container is about $\frac{1}{2}$ to $\frac{3}{4}$ full. The surface of the gravel should be fairly level.



WHAT HAPPENS TO FERTILIZER AFTER IT RAINS?

Sprinkle $\frac{1}{2}$ of a packet of powdered drink mix or about 1 tablespoon on the surface of the gravel to simulate fertilizer.

Pour water on the surface of the gravel to simulate rain.

Watch what happens.



WHAT HAPPENS TO FERTILIZER AND WATER WHEN THE WELL IS PUMPED?

Pump the well by inserting the tip of the syringe into the well (plastic tube) or attaching and pumping the hand pump.

Observe what happens to the fertilizer and water when the well is pumped.



DISCUSSION OF RESULTS

Use the following questions to lead discussion after building and demonstrating the model of over-applied fertilizer. (See *TAPS Manual* for answers.)

- What happens to the fertilizer when it rains?
- What happens when the well is pumped?
- What color is the water that is pumped out?
- Does the water color change as the well is pumped more?



LEAKING UNDERGROUND STORAGE TANK

Follow the instructions to build a model that will...

DEMONSTRATE HOW LEAKING UNDERGROUND STORAGE TANKS IMPACT GROUNDWATER SUPPLIES



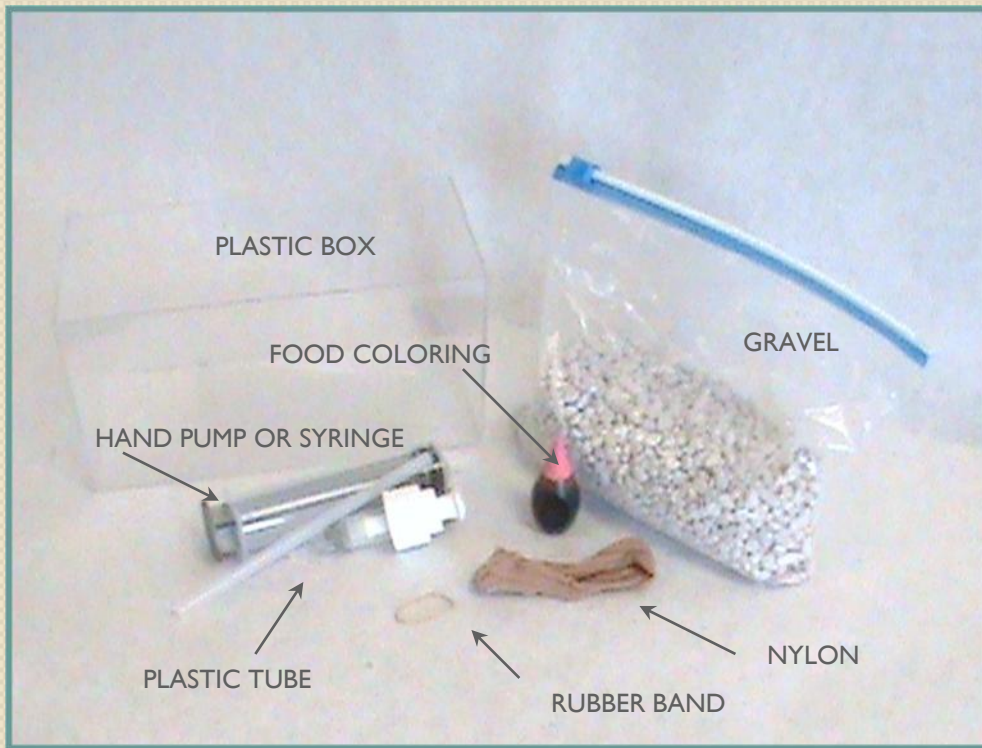
MATERIALS NEEDED

Use the following items from the Awesome Aquifer Kit:

Plastic box / Gravel / Food Coloring / Plastic tube / Nylon / Rubber band / Hand pump or Syringe

Additional Items, not included in the kit:

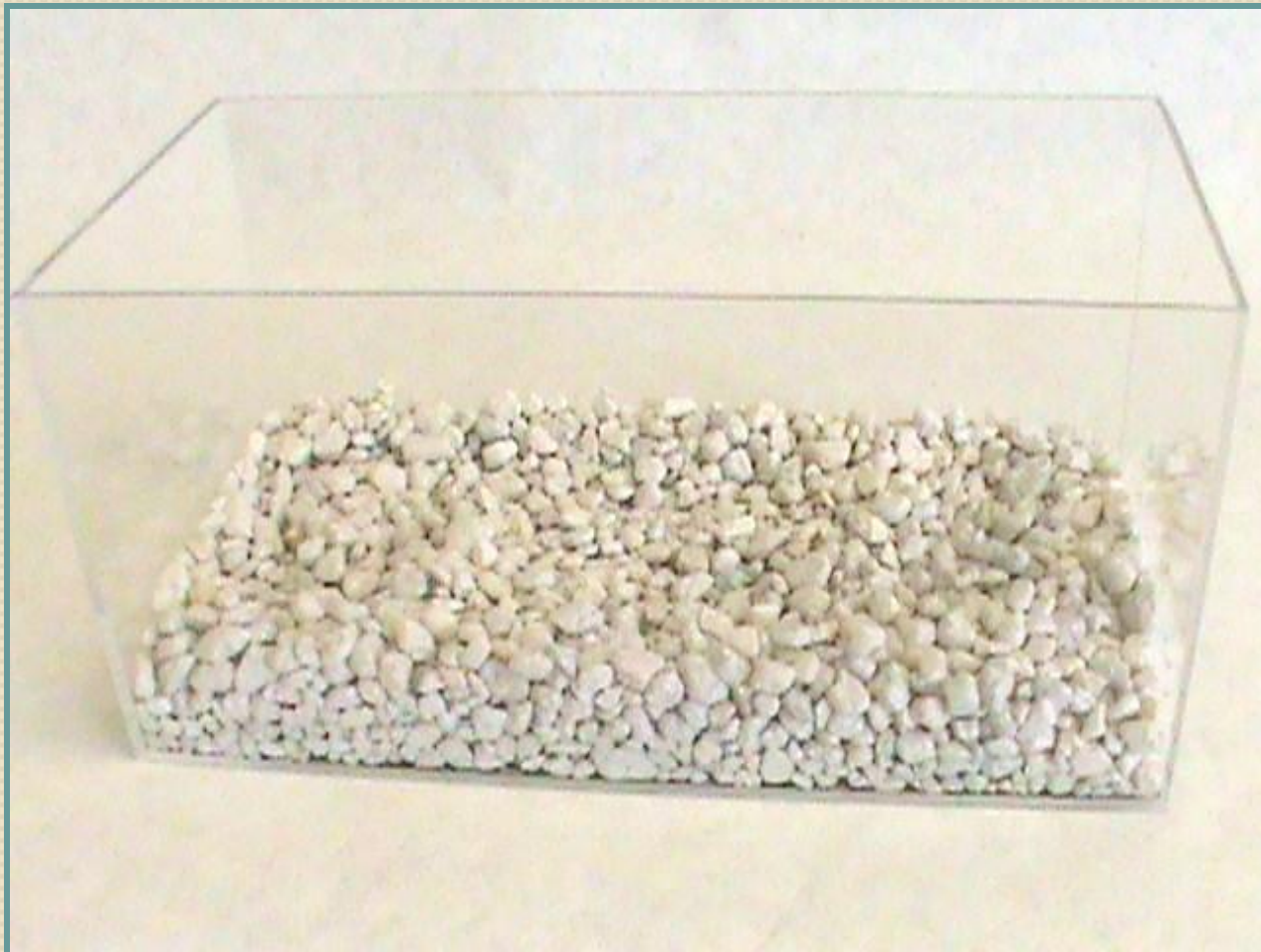
Film canister or small plastic container (balloon/small cup with lid) / Thumb tack / Pencil / Water



CREATE AN AQUIFER

Fill the plastic box with gravel until it is about $\frac{1}{4}$ - $\frac{1}{2}$ full.

Add water so that half of the rocks are covered.



CREATE A WELL (1)

Use a plastic tube as your well.

Cover one end of the tube with nylon, securing it with a rubber band. The nylon screen on the bottom represents a well screen which prevents sands and gravels from entering the well.

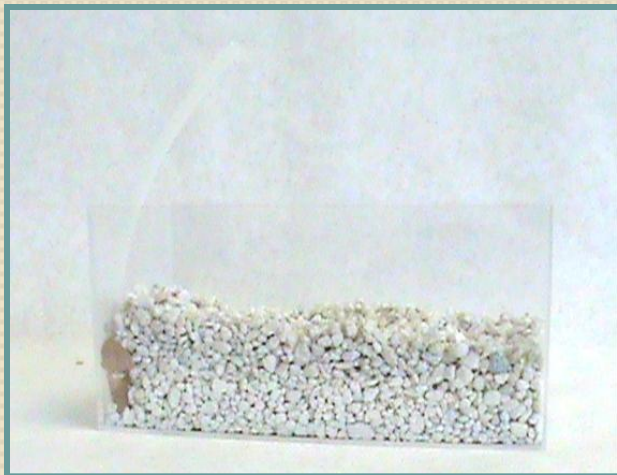
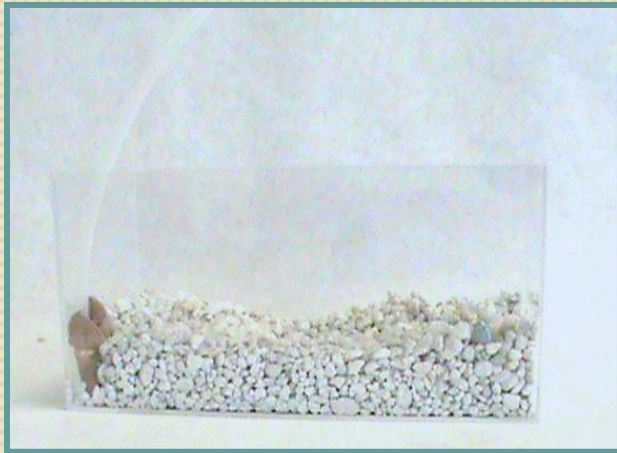


CREATE A WELL (2)

Insert the tube (well), with the well screen on the bottom, near one corner of the plastic box.

Push the well down so that it reaches the bottom of the model.

Add more gravel until the container is about $\frac{1}{2}$ to $\frac{3}{4}$ full. The surface of the gravel should be fairly level.



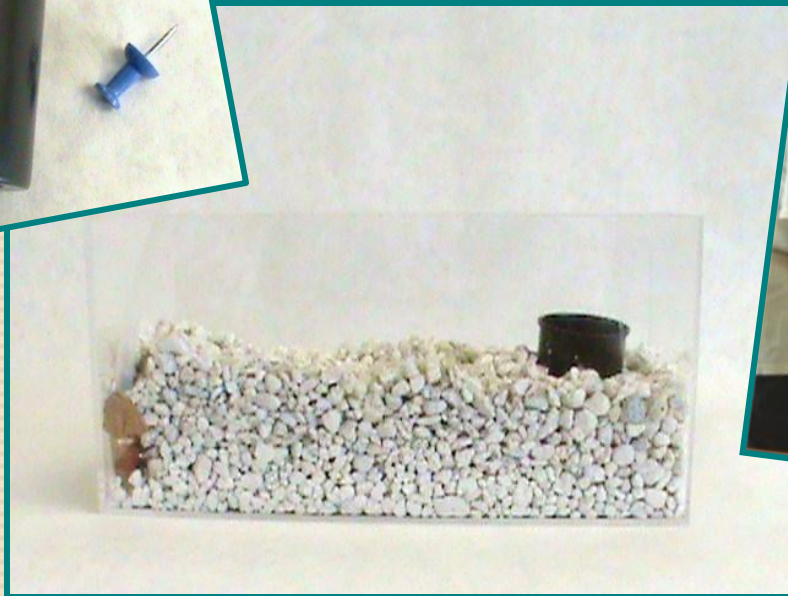
CREATE AN UNDERGROUND STORAGE TANK

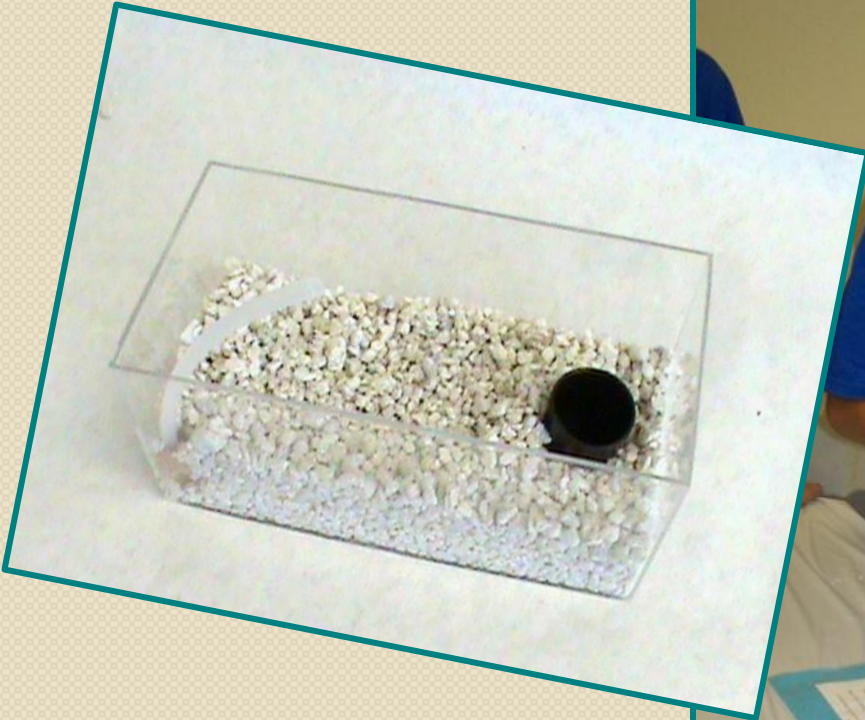
Using a tack, carefully poke holes in the film canister (or other small container.)

Dig a small hole, on the opposite side of the model from the well location, to place/bury the canister in the model. (It is fine to bury just the bottom half of the canister.)

Fill the canister with colored water. (Hold the canister over the plastic box or have it half buried when filling with the colored water.)

If you haven't done so, bury the canister. (The demonstration will work fine if just the bottom half of the canister (with holes) is buried.)





WHAT HAPPENS TO THE WATER INSIDE THE CANISTER?

Pour water on the surface of the gravel to simulate rain.

Observe what happens to the colored water inside the storage tank (small plastic canister) after it rained.

Pump the well by inserting the tip of the syringe into the well (plastic tube) or attaching and pumping the hand pump . Observe what happens to the groundwater when the well is pumped.



DISCUSSION OF RESULTS

Use the following questions to lead discussion after building and demonstrating the model of the leaking underground storage tank. (See *TAPS Manual for answers.*)

- What happens when it rains?
- How does the contaminant react?
- What happens when you pump the well?
- Why are leaking underground storage tanks a potential problem?



◦ IMPROPERLY OPERATED LANDFILL

Follow the instructions to build a model that will...

DEMONSTRATE WHAT HAPPENS TO GROUNDWATER WHEN LEACHATE FROM A LANDFILL CONTAMINATES THE AREA



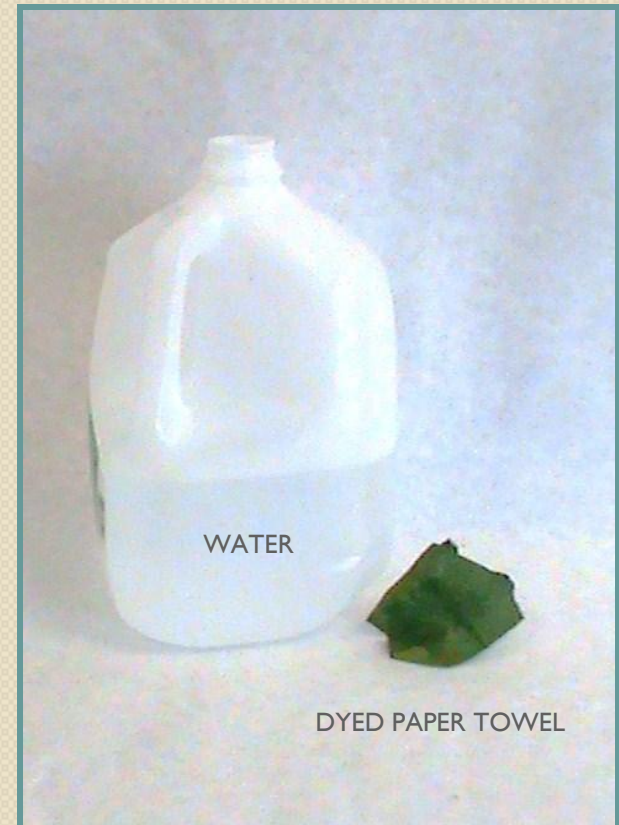
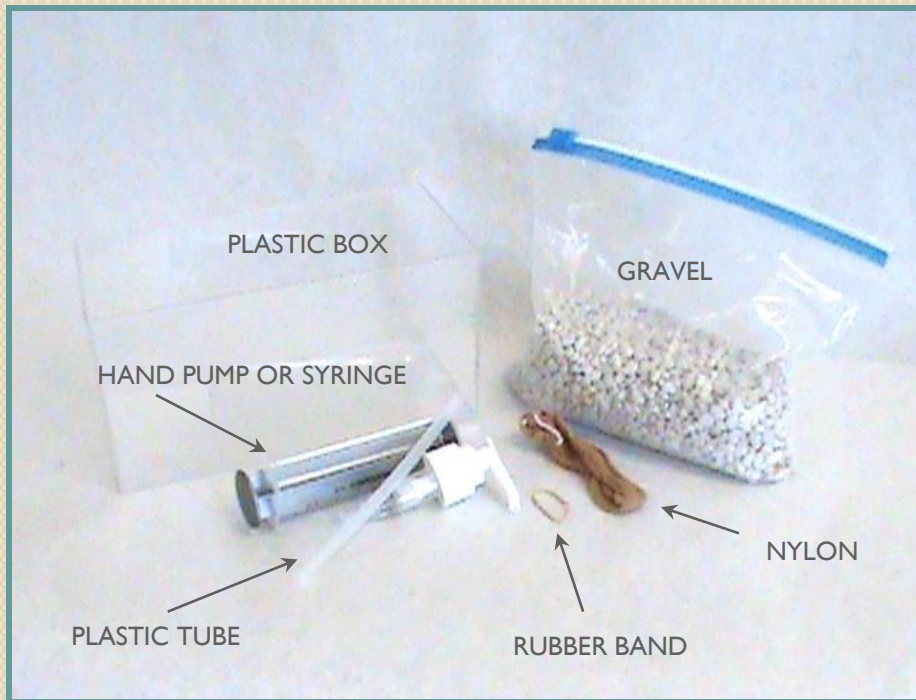
MATERIALS NEEDED

Use the following items from the Awesome Aquifer Kit:

Plastic box / Gravel / Plastic tube / Nylon / Rubber band / Hand pump or Syringe

Additional Items, not included in the kit:

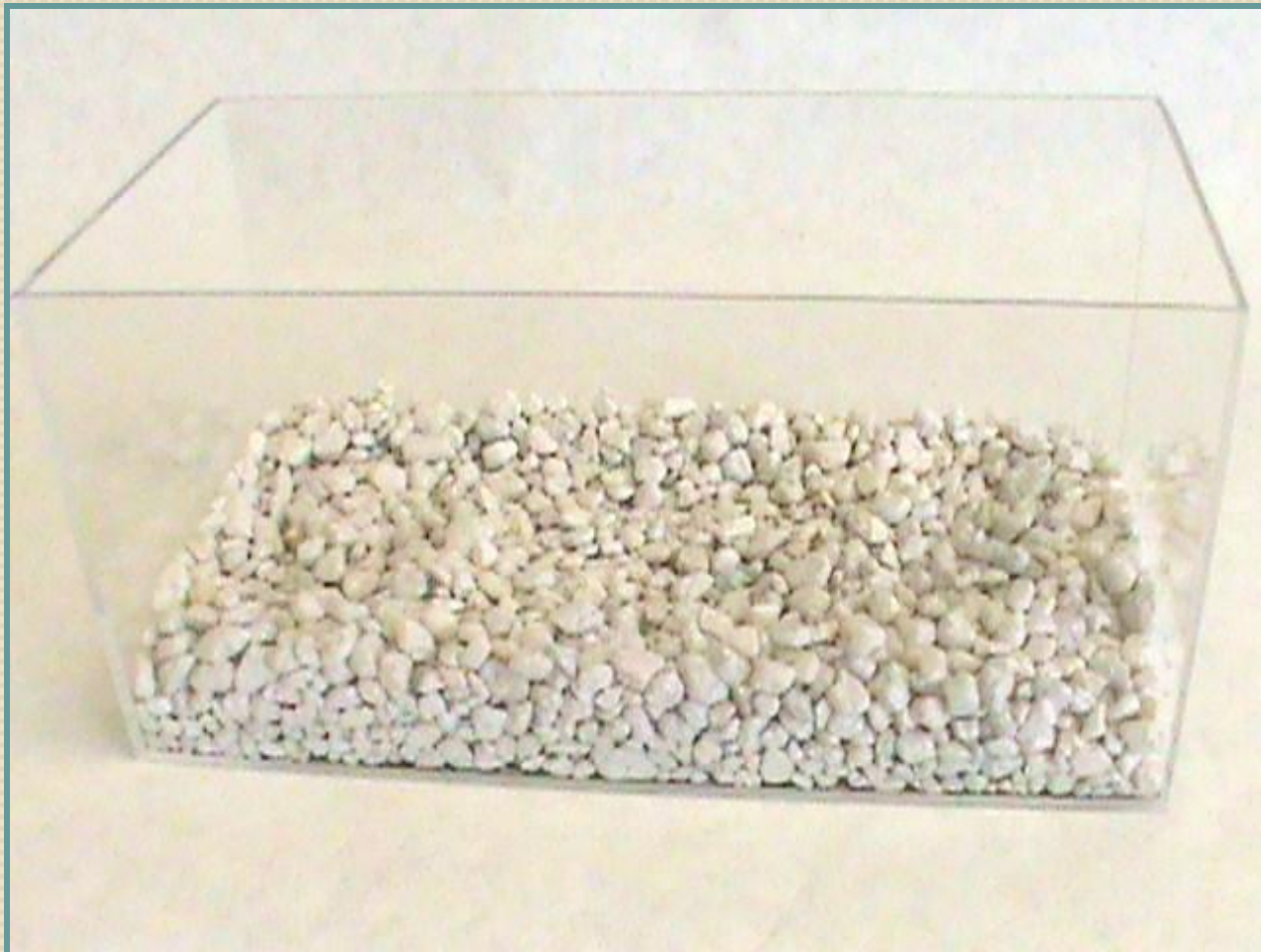
Water / A 2 inch square piece of dyed paper towel. - prepped at least 24 hours in advance by dipping it in/or spraying it with slightly diluted food coloring. As if you are tie dyeing the paper towel. Allow it to dry completely.



CREATE AN AQUIFER

Fill the plastic box with gravel until it is about $\frac{1}{2}$ full.

Add water so that half of the rocks are covered.



CREATE A WELL (1)

Use a plastic tube as your well.

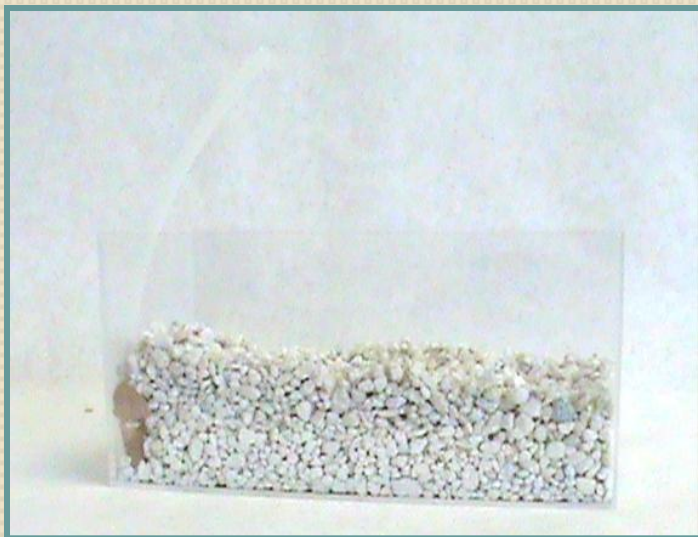
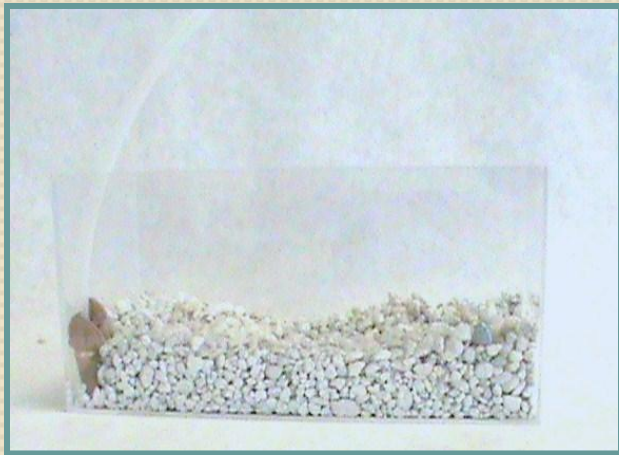
Cover one end of the tube with nylon, securing it with a rubber band. The nylon screen on the bottom represents a well screen which prevents sands and gravels from entering the well.



CREATE A WELL (2)

Insert the tube (well), with the well screen on the bottom, near one corner of the plastic box.

Push the well down so that it reaches the bottom of the model.



CREATE THE GARBAGE IN THE LANDFILL

Take the colored piece of paper towel, scrunch it up, and bury it on the opposite side of the model from the well location and near the outside of the model.



WHAT HAPPENS WHEN IT RAINS ON THE LANDFILL?

Pour water on the surface of the gravel to simulate rain.

Observe what happens to the landfill and groundwater after it rains.

Pump the well by inserting the tip of the syringe into the well (plastic tube) or attaching and pumping the hand pump. Observe what happens to the groundwater when the well is pumped.



DISCUSSION OF RESULTS

Use the following questions to lead discussion after building and demonstrating the model of the improperly operated landfill. (See *TAPS Manual* for answers.)

- What happens to the landfill when it begins to rain?
- What happens when the well is pumped?
- How could the contamination have been prevented?
- What else can be done to prevent this problem?

TAPS: Training About Protecting the Source
Hands-on Water Education

**Developed by The Groundwater Foundation with
support from the Nebraska Department of
Environmental Quality**

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Nebraska Department
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